

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
23 June 2005 (23.06.2005)

PCT

(10) International Publication Number
WO 2005/057463 A1

(51) International Patent Classification⁷: **G06F 19/00**,
A61N 5/00

Industry Liaison, Stevenson-Lawson Building, Rm. 328,
London, Ontario N6A 5B8 (CA).

(21) International Application Number:
PCT/CA2004/002108

(72) Inventors; and

(75) Inventors/Applicants (for US only): **GOLDMAN, Samuel, Pedro** [CA/CA]; 1144 Quinton Road, London, Ontario N6H 4R1 (CA). **BATTISTA, Jerry, J.** [CA/CA]; 87 Orkney Cr., London, Ontario N5X 3R8 (CA). **CHEN, Jeff, Z.** [CA/CA]; 134 Laurel St., London, Ontario N6H 4X1 (CA).

(22) International Filing Date:
10 December 2004 (10.12.2004)

(25) Filing Language: English

(26) Publication Language: English

(74) Agent: **BERESKIN & PARR**; 40 King Street West, Suite 4000, Toronto, Ontario M5H 3Y2 (CA).

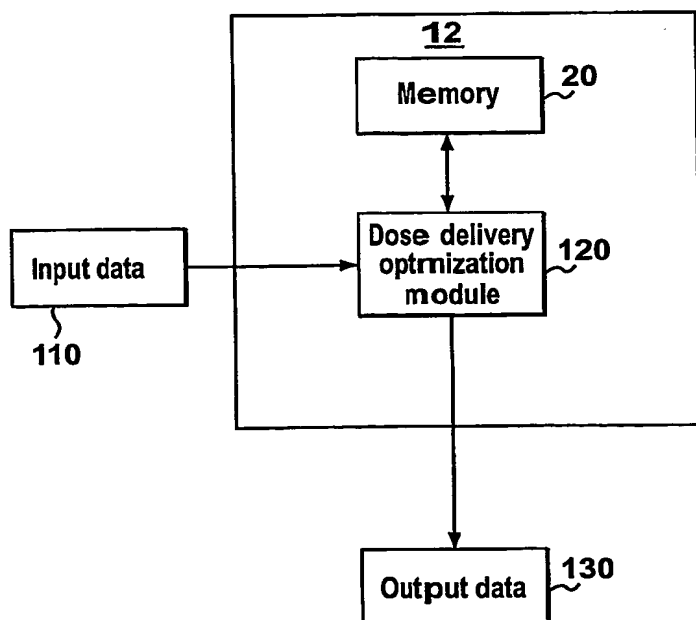
(30) Priority Data:
60/528,775 12 December 2003 (12.12.2003) US
60/566,433 30 April 2004 (30.04.2004) US
60/602,631 19 August 2004 (19.08.2004) US

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG,

(71) Applicant (for all designated States except US): **THE UNIVERSITY OF WESTERN ONTARIO** [CA/CA];

[Continued on next page]

(54) Title: METHOD AND SYSTEM FOR OPTIMIZING DOSE DELIVERY OF RADIATION



(57) Abstract: The invention relates to improved methods and systems for computationally efficient optimization of radiation dose delivery. The optimization involves determining an improved form of objective function to be used for mapping radiotherapy beams to a patient body volume having at least one target volume and at least one non-target volume. The objective function has a first term related to the at least one target volume and a second term related to the at least one non-target volume. The optimization further involves determining a minimum of the objective function, whereby beams mapped so as to pass through the at least one non-target volume are limited such that the second term is zero only if the weights of beamlets passing through the at least one non-target volume are zero. This limit helps to avoid the occurrence of negative beam weights, thereby facilitating computationally efficient determination of the minimum of the objective function using matrix inversion. Following the optimization, radiotherapy is delivered based on the determined minimum of the objective function.



PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM,
TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM,
ZW.

SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN,
GQ, GW, ML, MR, NE, SN, TD, TG).

(84) Designated States (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, MC, NL, PL, PT, RO,

Published:

— with international search report

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.